

# Using Dashboard Technology to Monitor Overdose Risk

Jennifer Kryskalla, PharmD; Shira Kern, MA; David Gray, PharmD; and Peter Hauser, MD

By identifying veterans who are receiving high-dose opioid prescriptions and who have risk factors for suicide, VISN 22 providers were able to intervene to mitigate the risk of accidental or intentional overdose.

On October 10, 2013, a Congressional hearing was held to address the issue of opioid medication prescribing within VHA facilities and clinics (House Veteran Affairs Subcommittee hearing “Between Peril and Promise: Facing the Dangers of VA’s Skyrocketing Use of Prescription Painkillers to Treat Veterans”). Several individuals testified, including the widows of 2 veterans; both their husbands had overdosed on prescribed opioid medications. One husband had been taking as many as 15 pills a day and was additionally prescribed oxycodone/acetaminophen, which led to his death.<sup>1</sup>

Alongside the widows were 2 veterans who had been treated for chronic back pain injuries sustained before and during deployment in Iraq. Both had been prescribed several pain medications, including oxycodone/acetaminophen, methadone, and morphine. One reported that as his pain increased, his doctors con-

tinued to provide him additional prescriptions; at one point he had more than 13 prescriptions and could no longer work from being so “doped up.”<sup>1</sup>

In the past 2 decades, health care professionals (HCPs) have placed greater emphasis on chronic pain management. As a result, the rate of opioid medication prescribing has increased dramatically. Since 1994, the number of opioid medication prescriptions has nearly doubled; this change has been accompanied by an increase in opioid misuse, which has resulted in accidental or intentional overdose and death.<sup>2</sup>

Based on a recent National Institute on Drug Abuse (NIDA) report, the greatest impact has been on armed forces personnel.<sup>3</sup> Prescriptions for pain relievers quadrupled between 2001 and 2009 to almost 3.8 million within the military population. Although civilian populations are more likely to abuse illicit drugs, military personnel are at particular risk of prescription abuse, including opioid medications.<sup>3</sup> In 2008, 11% of armed forces service members reported misusing prescription drugs, with opioid medications being the most abused. This is an approximate 5- to 6-fold increase since 2002 (2% reported misuse in 2002).<sup>3</sup>

Particularly concerning is the associated rise in suicide rates among armed forces personnel, which surpassed civilian suicide rates in 2004. In 2009, one-third of suicides among armed forces personnel involved prescription drugs.<sup>3</sup>

Certain patient characteristics or factors are related to greater overdose risk. These risk factors include prescription dosage and frequency, history of suicide attempts or self-harm behavior, history of depression or posttraumatic stress disorder (PTSD) among other mental health-related diagnoses, a history of substance and/or alcohol abuse, and within the context of opioid medication use, the concurrent use of other central nervous system (CNS) depressants.<sup>4,5</sup> Additionally, the stresses of deployment during wartime, physical injuries sustained in combat, and the unique military culture play a particularly important role in access to substances with high abuse potential and the subsequent development of substance abuse.<sup>3</sup>

## OPIOID USE AND RISK FACTORS

More than 3% of adults in the U.S. are now receiving opioid medications for chronic noncancer pain.<sup>6</sup> Substance abuse among patients with chronic pain ranges from 14% to 40%.<sup>5</sup> Pre-

**Dr. Kryskalla** is the VISN 22 pharmacoeconomist and pharmacy data analyst, **Ms. Kern** is a clinical research coordinator, **Dr. Gray** is the VISN 22 pharmacy executive, and **Dr. Hauser** is the VISN 22 mental health care services lead. Dr. Kryskalla, Dr. Gray, and Dr. Hauser are at the Desert Pacific Veterans Integrated Service Network in Long Beach, California. Ms. Kern is at the VA Long Beach Healthcare System.

Location	Prescriber (expand location to see prescriber name)	Patients (n) 120-199 mg MEDD	Patients (n) > 200 mg MEDD	All Patients With Chronic Opioid Rx (n)	% Patients 120-199 mg MEDD	% Patients > 200 mg MEDD	Target (< 3% > 200 mg)
☑ Facility 1		634	210	3,582	18	6	x
☒ Facility 2	All prescribers	230	124	1,517	15	8	x
	Prescriber 1	77	52	166	46	31	x
	Prescriber 2	19	10	97	20	10	x
	Prescriber 3	18	8	97	19	8	x
	Prescriber 4	11	7	37	30	19	x
	Prescriber 5	9	6	54	17	11	x
	Prescriber 6	8	5	64	13	8	x
	Prescriber 7	10	4	68	15	6	x
	Prescriber 8	7	4	40	18	10	x

**Figure 1.** Illustration of VISN 22 High-Risk Opioid Dashboard. Facility-level data can be expanded to display prescriber-level data.

MEDD = morphine equivalent daily dose.

scription opioid medications are the fastest growing drugs of abuse and the most common cause of unintentional overdose in the U.S.<sup>4</sup> About 17,000 deaths occur each year as a result of prescription opioid medication overdose.<sup>7</sup> Opioid medication-related overdose deaths began to increase in the early 2000s and continue to increase. Between 1999 and 2007, the rate of unintentional overdose-related deaths in the U.S. increased by 124%, largely due to the increase of prescription opioid medications.<sup>8</sup>

### High-Dose Opioid Medication Use

A study by Dunn and colleagues found that patients receiving higher doses of prescribed opioid medications were at an increased risk of overdose.<sup>6</sup> Patients receiving 50 mg to 99 mg morphine equivalent daily dose (MEDD) had a 3.7-fold increase in overdose risk (0.7% annual overdose rate) as compared with patients who received < 50 mg MEDD (0.2% annual overdose rate). Patients receiving ≥ 100 mg MEDD had a 1.8% annual overdose rate and a 9.8-fold increase in overdose risk as compared with patients

who received < 50 mg MEDD. Overall, 51 patients experienced ≥ 1 overdose event, 40 of whom experienced fatal or serious overdoses and 6 of whom attempted suicide. Patients receiving the highest doses were male, current smokers, and had a history of depression and substance abuse.<sup>6</sup> Similarly, a study by Bohnert and colleagues found that opioid medication overdose was most likely to occur in those patients with psychiatric and substance use disorders compared with patients who had no psychiatric illness history.<sup>8</sup>

### Depression

Mood disorders are common in people with chronic pain.<sup>4,5,9,10</sup> In particular, patients with a history of depression are more likely to receive chronic opioid medication prescriptions and are at a higher risk for opioid medication abuse. A substance abuse history is the most consistent predictor of both chronic opioid medication use and abuse. However, depression without substance abuse is significantly associated with 2 forms of opioid medication abuse: self-medication for stress or sleep and

overmedication (using a higher dose than prescribed). More severe cases of depression show a stronger association for potential abuse.<sup>4</sup>

### PTSD

Among Iraq and Afghanistan war veterans with ≥ 1 pain-related diagnosis, veterans with PTSD and veterans with a mental health disorder other than PTSD were significantly more likely to receive opioid medications for pain than were veterans without a mental health disorder (PTSD—17.8%, adjusted relative risk [RR] 2.58; other mental health disorder—11.7%, RR 1.74; no mental health disorder—6.5%).<sup>2</sup> Although mental health disorders in general were related to a higher risk of opioid abuse, those with PTSD in particular were more likely to receive higher prescribed dosages; to continue taking opioids for a longer period; to receive concurrent prescriptions for opioid medications, sedative hypnotics, or both; to obtain early refills; and to have comorbid alcohol and substance use disorders. Based on these results, Seal and colleagues concluded that veterans with PTSD had

Patient Name	Risk Factors	UDS Dates	UDS Results	Illicit Drug Screen Dates	Illicit Drug Screen Results	Total MEDD / CNS Depressants
Test patient  Last 4: xxxx Age: xx  Chronic opioid Rx	PTSD + suicide risk + depression  Substance Abuse history + CNS depressants	1/25/2014 1/25/2014 1/25/2014 1/25/2014 1/25/2014 1/25/2014	Amphetamines: (-) Barbiturates: (-) Benzos: (+) Methadone: (-) Oxymorphone, urine: (+) Opiates: (+) Oxycodone: (+)	1/25/2014 1/25/2014	Cannabinoids: (+) Cocaine: (-)	390 mg  CNS depressants: Baclofen 20 mg tab Temazepam 30 mg cap
Drug	Prescriber	Release Date	Days Supply & Quantity	Drug Daily Morphine Equivalent	Primary Care Provider	
Oxycodone HCL 30 mg tab  Take 1 or 2 tablet(s) by mouth every 4 hours as needed for severe pain	Dr Prescriber	5/12/2014	Days supply: 30  Quantity: 200	300 mg	Dr Primary Care	
Morphine SO4, 30 mg tab, SA  Take 1 tablet by mouth 3 times a day for pain	Dr Prescriber	5/12/2014	Days supply: 30  Quantity: 200	90 mg	Dr Primary Care	

**Figure 2.** Illustration of a patient-level report. The report displays selected comorbidities and concomitant central nervous system depressants, urine, drug screen data, and opioid prescription information. The data have been modified to protect patient privacy.

CNS = central nervous system; MEDD = morphine equivalent daily dose; UDS = urine drug screen.

the highest risk of alcohol, drug, and opioid-related accidents and overdose as well as self-inflicted injuries.<sup>2</sup>

### Concurrent Use of Opioids and CNS Depressants

As mentioned earlier, studies suggest that people with PTSD are at a significantly higher risk for opioid medication overdose. One factor that may contribute to this higher risk is the concurrent use of CNS depressants/sedatives, particularly benzodiazepines and alcohol.

Benzodiazepines are often prescribed for people with PTSD. One study found that the concurrent use of benzodiazepines is significantly related to opioid overdose.<sup>5</sup> Prescribing

opioids for people already abusing or dependent on alcohol or other substances increases the risk of abuse and overdose. Furthermore, the concurrent use of multiple medications is associated with aberrant behaviors, cognitive impairment, and medication abuse, potentially leading to overdose. Overall, the combined administration of these medications is responsible for higher rates of adverse events, overdose, and death related to prescription opioid medication use.<sup>5,6,11</sup>

In summary, there are various risk factors that contribute to opioid medication overdose and more generally, risk of suicide, including (1) high-dose opioid medications; (2) history of psychiatric disorders,

specifically depression and PTSD; (3) history of substance use disorders; and (4) concurrent use of opioid medications and prescription sedatives (specifically benzodiazepines) as well as alcohol and nonprescription drugs of abuse.

### Suicide

Suicide is the tenth leading cause of death in the U.S., with 12.4 suicide deaths per 100,000 population.<sup>12</sup> Suicide rates are even higher among veterans. According to the VHA, the age-adjusted rate of suicide for veterans using VHA facilities and clinics was 35.9 per 100,000 person-years for fiscal year 2009.<sup>13</sup> Several risk factors for suicide attempts include depression

Location	Prescriber (expand location for prescriber name)	Patients (n) Daily Morphine > 200 mg	All Patients With Opioid Rx (n)	% Patients With MEDD > 200 mg	Target (< 5% > 200 mg)
Las Vegas		368	5,835	6	θ
Long Beach		154	3,631	4	✓
Loma Linda		270	7,816	3	✓
San Diego		257	4,979	5	θ
Los Angeles		88	5,945	1	✓
VISN 22		1,137	28,206	4	✓

**Figure 3.** Illustration of VISN 22 High-Risk Opioid Dashboard in January 2013, 1 Month After Implementation. The initial target was set at < 5% of patients with opioid prescriptions having > 200 mg daily morphine equivalent daily dose (MEDD). This target was subsequently lowered to < 3%.

and other mental health disorders, substance abuse, medical disorders, and prescription medications.

Prior suicide attempts or self-harm behavior is known to increase the risk of subsequent death by suicide. About 11 attempted suicides occur per suicide death where the medical severity of prior attempts increases the risk of future suicide, as does a history of multiple self-harm episodes.<sup>14,15</sup> One study found that the single best predictor of suicide in a veteran population was an attempt in the previous 4 months.<sup>16</sup>

Among other risk factors, previous suicide attempts and violent behavior are major behavioral flags that warrant caution and require particular consideration when prescribing opioid medications. In a national survey on drug use and health, about 18% of prescription opioid users/abusers who experienced suicidal ideations actually attempted suicide. Only 11% of individuals who never used prescription opioid medications attempted suicide after reported suicidal ideations.<sup>17</sup>

## PATIENT DATA AGGREGATION

The early and widespread adoption of electronic medical records (EMRs)

by the VHA allowed the aggregation of patient data for quality improvement. Initially, data were aggregated, and dashboards were designed retrospectively. However, the development of regional data warehouses that update patient information daily from the EMR allowed information to be aggregated prospectively, and dashboards were designed that provided real-time information.

The purpose of the current study is to demonstrate the efficacy and future potential of dashboard technology in assessing prospectively high-risk factors for opioid overdose. Dashboards are a user-friendly application that allows providers to isolate and calculate daily morphine equivalent opioid dosages and assess patients' risk factors for overdose on an individual basis. By using this technology, providers who prescribe opioids can get a concise summary of opioid and other medications and adjust medications to decrease overdose risk on an individual basis.

## What Is the Dashboard?

The VISN 22 high-risk opioid dashboard is a business intelligence tool that serves as a report card, or prog-

ress report, to provide a global view of the number of veterans who are receiving opioid prescriptions totaling >120 mg MEDD and who have characteristics (history of depression, PTSD, substance abuse, or high-risk suicide flag) and prescriptions (concomitant CNS depressants) that may increase patient risk for overdose.

The VISN 22 dashboard allows the user to navigate to an individual HCP-level and patient-level report (Figures 1 and 2). Filter settings allow report users to select only high-risk patients; it serves as a single location for pertinent details to consider for safely prescribing opioids.

To calculate daily morphine equivalents, each patient's opioid prescriptions were evaluated. The quantity was divided by the day's supply to calculate an average daily quantity. From there, the drug strength was used to convert to MEDD. Health care providers were informed that these conversion factors were not recommendations for clinical opioid conversions.

## Implementation and Design

In 2012, the VA Pharmacy Benefits Management (PBM) in VISN 21 created a dashboard that allowed users

Location	Prescriber (expand location for prescriber name)	Patients (n) 120-199 mg MEDD	Patients (n) > 200 mg MEDD	All Patients With Opioid Rx (n)	% Patients With 120 - 199 mg MEDD	% Patients With > 200 mg MEDD	New 2014 Target (< 3% > 200 mg)
Las Vegas		438	240	5,868	7	4	x
Long Beach		103	136	2,988	3	5	x
Loma Linda		266	194	7,123	4	3	0
San Diego		260	199	4,826	5	4	x
Los Angeles		122	67	5,276	2	1	✓
VISN 22		1,189	836	26,081	5	3	θ

**Figure 4.** Illustration of VISN 22 High-Risk Opioid Dashboard results in July 2014, 18 months after implementation. The target for percentage of patients > 200 mg morphine equivalent daily dose (MEDD) was reduced to < 3% (initial target in January 2013 was < 5%). Also, a column was added to monitor patients prescribed > 120 mg but < 199 mg MEDD.

to identify patients on high-dose opioid prescriptions. Structured query language code was used to extract data from the regional data warehouse and calculate MEDD for all patients with active opioid prescriptions. In 2013, VISN 22 expanded that dashboard to incorporate factors that could indicate a high risk for overdose or other adverse outcomes, including a history of depression, PTSD, substance abuse or high-risk suicide flag, and concomitant use of CNS depressant medications.

The high-risk opioid dashboard (Figure 3) and accompanying patient-level report were first introduced to VISN 22 HCPs in January 2013. The business intelligence tools were introduced to each facility through the VISN 22 PBM group. Training on the use of the dashboard and the report was provided, with an initial target of decreasing MEDD of > 200 mg to < 5% of all veterans prescribed opioids at each VISN 22 facility. One month later (in February 2013), a second category of veterans (those with > 120 mg but < 199 mg MEDD) was added. Also the initial MEDD > 200 mg target of < 5% was de-

creased to < 3% to encourage additional progress.

Eight months after the VISN 22 dashboard technology was implemented there was a 17% decrease in patients with total daily morphine equivalents > 200 mg (January 2013; 1,137 patients vs August 2013; 940 patients—a decrease of 197 patients).

From March 2013 to August 2013, VISN 22 also saw a 12% decrease in the number of patients prescribed > 120 mg MEDD but < 199 MEDD (March 2013; 2,295 vs August 2013; 2,018—a decrease of 277 patients).

Figure 4 shows opioid use as of July 2014 for VISN 22 facilities. There were further reductions in the number of patients receiving > 120 mg but < 199 mg MEDD (August 2013; 2,018 patients vs July 2014; 1,189 patients) and patients receiving > 200 mg MEDD (August 2013; 940 patients vs July 2014; 836 patients).

### CASE DESCRIPTION

In January 2013, VISN 22 implemented dashboard technology to help providers assess and monitor opioid prescription levels in relation to high-risk variables. The benefits of this dashboard technology are illus-

trated in the case profile that follows.

A 67-year-old male veteran had a long history of chronic pain. Pain diagnoses included osteoarthritis with spine involvement, lumbar radiculopathy, arthralgia, and peripheral neuropathy. For the past 10 years, he was prescribed opioids with modest relief of his chronic pain symptoms despite recent prescriptions totaling 300 mg MEDD. This veteran had several risk factors for overdose, including a history of depression, suicide risk, PTSD, and concomitant use of the CNS depressants alprazolam and cyclobenzaprine.

More recently, in May 2013, the veteran exhibited aberrant behavior and requested early refills for alprazolam. In response, the pharmacist discussed the case with the HCP who prescribed the opioids, noting the concomitant overdose risk factors. As a result of this interaction, the veteran was referred for mental health services, and his prescriptions for opioids were gradually decreased. He is currently stable, now receiving 120 mg MEDD, and his pain is currently described as moderately controlled on the new lower dose.

In summary, this veteran was re-

ceiving > 200 mg MEDD with several known overdose risk factors. Once the HCP was made aware of these risk factors, necessary precautions were taken, and the veteran was safely tapered to a lower dose. Dashboard technology makes the list of risk factors readily available to HCPs who are prescribing (and the pharmacists reviewing the prescriptions), thus allowing a proactive discussion of risks and benefits before continuing, renewing, or initiating opioid prescriptions.

## DISCUSSION

As reported in 2013 by NIDA, the greater availability of opioid medications and the consequent increase in prescriptions may be contributing directly to their growing misuse by both civilians and military service personnel. A direct consequence has been an increase in both accidental and intentional overdose deaths.<sup>3</sup> Several factors are related to the risk of overdose/death, including high-dose opioid medications, a history of psychiatric disorders (specifically depression and PTSD), a history of substance use disorders, concurrent use of opioid medications and prescription sedatives (specifically benzodiazepines) as well as alcohol and nonprescription drugs of abuse, and previous attempts of suicide.

The VISN 22 high-risk opioid dashboard was a rapid information technology response to the increasing risk faced by veterans who have chronic pain and comorbid psychiatric and substance use disorders and are prescribed opioids and CNS depressants. The purpose of implementing this dashboard technology was to assist HCPs in prescribing opioids safely, using a technology that allows for the monitoring and management of concomitant suicide risk factors. Following the national Opi-

oid Safety Initiative, this dashboard tool is being used to identify veterans who are on high-dose opioids with the goal of reducing the number of veterans on > 200 mg MEDD. The dashboard allows data to be stratified, using the concomitant risk factors for suicide to assist facilities and their providers in the identification and prioritization of highest risk patients first.

An initial review of dashboard data in VISN 22 suggests that it is a useful tool for reducing high-dose opioid prescriptions (> 200 mg MEDD and > 120 mg but < 199 mg MEDD). Across the 5 VA locations in VISN 22, in the first 8 months of implementation, 4 locations were able to lower prescription opioid medication levels to the initial target of < 5%; 2 lowered rates even further (to < 3%). The VA Greater Los Angeles Healthcare System remains at a commendable 1%. Although the number of veterans with prescriptions totaling > 200 mg MEDD has decreased as a result, a greater reduction is expected with the coordinated education and systems improvement efforts associated with the national VHA Opioid Safety Initiative. As part of the process to lower the number of patients on high-dose opioids in the future, HCP and patient education will be provided in relation to the use of dashboard technology.

## LIMITATIONS

There are several limitations that affect interpretation of the usefulness of the VISN 22 high-risk opioid dashboard. Prior to the implementation of the dashboard, 2 of 5 VISN sites already had efforts in place to reduce opioid overprescribing. The VA Greater Los Angeles Healthcare System had an opioid reduction program in place before the dashboard

was implemented, so it is possible reductions in opioid prescribing were a result of their previous efforts and not related to the dashboard. Similarly the VA Long Beach Healthcare System had begun a quality improvement initiative to reduce high-dose opioid prescribing prior to dashboard implementation. However, it was difficult to pinpoint the direct effect the dashboard had on patient interventions due to lack of documentation of dashboard use in the clinical notes.

A direct relationship did exist between dashboard implementation and opioid dose reduction in patients with > 200 MEDD at the remaining 3 VISN 22 facilities. Overall, this suggests that the dashboard played a significant role across all sites. Implementation of the dashboard across VISN 22 was accompanied by an education effort that resulted in an increased awareness among HCPs to evaluate certain risks in patients on high-dose opioids and to evaluate the combination of opioid and CNS depressant use. Prior to dashboard implementation, there was no standardized monitoring system that cross-referenced high-dose opioid prescribing with psychiatric illness and suicide risk factors.

## CONCLUSIONS

From 2000 to 2010, opioid prescriptions nearly doubled, yet this rate was not accompanied by a change/increase in the rate of nonopioid analgesic medication prescriptions.<sup>18</sup> Health care providers need to account for veterans' wishes for pain treatment and be aware of options other than opioids, particularly given the risk of opioid-related accidental or intentional overdose; it is imperative that treatment become more individualized and more closely monitored.<sup>19,20</sup> It is recommended that opioids should be the treatment

of last resort in managing chronic noncancer pain. The use of opioid prescription medications should be intended as a trial, supported by clear goals and an unequivocal understanding that doses will not be indiscriminately increased.<sup>20</sup>

Health care providers who prescribe opioids are ultimately responsible for monitoring risk factors that may increase overdose and death, and dashboard technology assists them in this effort. The VISN 22 high-risk opioid dashboard is a tool that allows providers to identify and prioritize veterans who are at high risk for overdose. Initial data collected suggest that the dashboard has decreased the risk of negative consequences associated with opioid medication use today. However, the authors wish to emphasize that this technology is only part of the solution; although it can be a tool to identify actions that may need to take place and can track progress of changes in care, there must be complementary efforts in provider and patient education, improved access to mental health care, and interdisciplinary models of care that expand current chronic pain treatment options. Future considerations of this technology may include incorporating other risk factors accounting for psychosocial variables specific to military personnel that may further increase the overall risk of overdose. ●

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